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Understanding teachers' mental models of collaboration to enhance the learning community

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ABSTRACT

This study examined representations of Finnish basic education teachers' mental models of collaboration to reveal the background features that enable or hinder changes in a school community and teacher collaboration. In this case study, we explored 41 teachers' mental models of collaboration in a one-school community to identify and understand the features that enhance or challenge collaboration. The findings raise the question of how collaboration can support a school's transition to a unified comprehensive school, when teachers are accustomed to working alone with a strong sense of autonomy and diverse mental models of collaboration. The findings revealed that collaboration is mainly limited to planning and sharing ideas and that teachers' involvement in administrative work limits pedagogical discussions between teachers. Our findings suggest that the mental models examined may play a crucial role in building a school's collaborative culture, promoting curriculum principles and developing a learning community.

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Mental models;
collaboration; learning
community; school
development

Introduction

Strengthening teacher collaboration is an area that has gained interest among educators through the promotion of learning communities. According to Senge et al. (2012), teachers should have opportunities to develop professionally and develop their schools through collaboration with other teachers, school staff and students. Also, teacher collaboration is an important part of teachers' work-life and continuous learning (de Jong, Meirink, and Admiraal 2019). Yet, research has increasingly shown that strengthening teachers' collaboration at the school level is a key method to increase the effectiveness of education, promote school development and enhance teachers' job satisfaction and self-efficacy (see, e.g. Forte and Flores 2014; Hargreaves and O'Connor 2017; Vescio, Ross, and Adams 2008). In a sense, this underlines the understanding that collaboration should not be understood as an end in itself; instead, it must be linked to a school's development goals, of which students' learning is central (Fullan and Hargreaves 2016).

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Although collaboration has become a common way of tackling increasingly complex issues (e.g. teachers' professional development, improvements in teaching and student's learning) (Hauge and Wan 2019), a collaboration that enables interdependence between teachers (e.g. observing, providing feedback, collaborative professional learning and team teaching) is less common than collaborative work, such as discussing the learning of specific students or exchanging teaching materials (OECD 2020). Exploring different forms of collaboration alone does not provide answers to how teachers perceive collaboration, as teacher collaboration concerns a school's social dimension (de Jong, Meirink, and Admiraal 2019). Thus, this study captures teacher collaboration from a less examined perspective related to school development and themes of change in the school context.

This study approached Finnish basic education teachers' representations of mental models of teacher collaboration in a school community to identify and understand the essential features that enhance and challenge teacher collaboration in current and future school communities. This study was part of a larger project called "Creative Expertise – Bridging Pre-service and In-service Teacher Education", funded by the Finnish Ministry of Education and Culture (2017–2021). This project was part of the national Finnish Teacher Education Forum, which prepared the "Development Programme for Teachers' Pre- and In-service Education".

In this case study, teachers' collaboration was examined by interviewing teachers working in the same school community. This study describes the initial state of one school that was in a state of transition to a new building and school community – more precisely, towards a unified comprehensive school. This is a significant shift in Finland as more schools are being unified (Lahtero and Risku 2012). Although the number of unified comprehensive schools has increased by 10% over the last 10 years and 20% of the comprehensive schools are now unified (SVT (Suomen virallinen tilasto) 2019), there is scant research on the unification process and operability of unified schools. Focusing on teachers' ways of thinking might reveal the possible background features that enable or hinder changes in a school community and teacher collaboration.

This study sought to answer the following research questions:

- (1) What forms of collaboration do teachers attach to their work?
- (2) What do teachers think about different forms of collaboration, and what types of collaborative work do they consider relevant during a period of change?

Mental models as representations of teachers' collaboration in a learning community's framework

Unravelling teachers' mental models is not only a way to explain teachers' assumptions or thinking; it is also strongly linked to the effort to understand how teachers collaborate and what forms of collaboration and types of collaborative work they consider relevant during a school's process of change. To explore this, a study was conducted within the framework of (Senge's (1990), 2006, Senge et al. (2012)) work on learning organisations, famously described in his book Senge (1990). Senge's idea of a learning organisation refers to five disciplines (e.g. mental models, personal mastery, shared vision, team learning and systems thinking), which are intertwined (Senge 1990). Alongside Senge's

work on learning organisations, this study's framework stems from Finland's national core curriculum for basic education (FNBE (Finnish National Board of Education) 2014), whereby a learning community is at the core of a school's culture. This is the first time that Finland's national curriculum for basic education has empathetically considered the importance of a learning community as part of a curriculum (FNBE (Finnish National Board of Education) 2014). In this section, we briefly review the definitions of mental models, teacher collaboration and a learning community and bridge them by considering previous research.

In terms of school development, the role of mental models is relevant. Interviewing the teachers at the beginning of the school's development project and working with their mental models helped us understand the nature of the persistent but commonly hidden challenges in a school community. This idea is based on the fact that the systems educators strive to improve and develop are often based on attitudes and values, and mental models, "our theories of how the world works", guide the actions of individuals and systems (Senge et al. 2012, 131). Mental models work as mechanisms to generate descriptions, explanations and predictions of social-system states (Johnson-Laird 1983; Rouse and Morris 1986). According to Senge (2006), mental models are "deeply ingrained assumptions, generalisations or even pictures of images that influence how we understand the world and how we take action, and mental models are 'intricately intertwined' with the discipline of systems thinking" (Senge et al. 2012, 127). Thus, mental models alone do not reveal an entire picture of a school community; for example, in addition to teachers' personal mastery, they help to outline development initiatives and generate opportunities to build a shared vision, collaboration and teamwork between teachers.

Exploring mental models helps teachers make sense of their surroundings and act appropriately in different situations (Rouse and Morris 1986; Mathieu et al. 2000). In one of the earliest studies on mental models, Rouse and Morris (1986) expressed that mental models allow people to describe a system's purpose and form, explain a system's functioning and observed system states and predict future system states. However, due to the nature of mental models, they generally remain unexamined and tacit (Mevorach and Strauss 2012; Senge 2006). By nature, mental models function selectively, for example, by leaving out data; therefore, "they are incomplete, sometimes distorted, narrow or single-framed" models derived and constructed from real-world experience (Werhane 2008, 464). The study of teachers' mental models was particularly valuable at the beginning of the development project, as mental models often remain unexamined, which may undermine the success of change initiatives (Senge et al. 2012; Tarnanen et al. 2021).

Research on mental models has been conducted in a variety of contexts in the field of teacher education and learning. Mental models of teacher students have been studied broadly in relation to the development of scientific thinking and concepts (Dinçer and Örgan 2021; Kiray 2016), environment (Moseley, Desjean-Perrotta, and Utley 2010) and learning approaches (Helen, Murray-Harvey, and Lawson 2007). Also, studies on pre-service teachers' mental models suggest that a mental model develops from general to discipline-specific practice (Wilke and Carol Losh 2012), and teacher students' mental models can be built heavily on their own school-time experiences (Helen, Murray-Harvey, and Lawson 2007).

Widmann and Mulder (2020) studied in-service vocational teachers' team learning behaviours to understand team learning and team mental models. Mental models have also been studied in relation to lifelong learning (Philip, van Schaik, and Hudson 1998), shared mental model development in school leadership teams (Chrispeels et al. 2008), school management teams (Chen-Levi, Schechter, and Buskila 2020) and elementary school principals' mental models related to instructional leadership (Ruff and Shoho 2005). However, in-service teachers' mental models related to teacher collaboration or school-community development have been scarcely explored.

The term "teacher collaboration" has become popular amid an ongoing change in education. This current study was driven by the need to understand teacher collaboration more broadly – in other words, the multiple aspects of collaboration, as different forms of collaboration require a different depth of collaboration. According to a review, the definition of teacher collaboration is broad, and it is challenging to form a clear, coherent picture (Vangrieken et al. 2015). When studying teacher collaboration, it is necessary to determine whether a collaboration is being explored to, for example, promote practical issues or to develop teaching or teamwork (Vangrieken et al. 2015). Hargreaves and O'Connor (2017) suggested that teacher collaboration should concentrate on teachers' joint work and improve their teaching practices. Furthermore, collaboration is considered a crucial resource for breaking the culture of individualism in teaching, which prevents the development of new teaching practices (Hargreaves 2019).

That said, the picture of collaboration's effectiveness is slightly unclear, and uncertainty still exists about the relationship between collaboration and teachers' development and learning (Forte and Flores 2014; Opfer and Pedder 2011). Not all forms of collaboration positively affect teachers; collaborative professionalism can create anxiety in some teachers due to the nature of a school community (Fullan and Hargreaves 2016). Similarly, regardless of the possible positive impact on school communities, it is difficult to sustain and implement the enthusiasm initially generated by the idea of learning because emotions and power relations can restrict learning (Forte and Flores 2014; Vince 2001) and professional disagreement and mutual critique (Lockton and Fargason 2019). The culture of teachers working alone in classrooms (Vescio, Ross, and Adams 2008) or in silos of different subjects, grade levels or teacher groups (i.e. primary school and subject teachers) are recognised in the educational research literature (Hargreaves 2019).

Although collaboration is an essential part of learning in a school, there is a lack of structures and conditions (e.g. space and time, supportive working conditions, and practices) that support knowledge and skill-sharing between teachers (Opfer and Pedder 2011). If collaboration is not an integral part of teachers' daily work, educators will likely work in isolation (Richard et al. 2016). Kelchtermans (2006) noted that exploring collaboration in an organisational context is effective method for understanding this phenomenon.

Throughout this article, "teacher collaboration" will refer to the interactions between teachers to share knowledge, perform a shared task related to teaching and school development or reveal about their teaching and learning. In this study, when the teachers talked about their collaboration, they voiced their mental models, making it possible to examine them (see, e.g. Mevorach and Strauss 2012; Senge 2006). A broad definition of teacher collaboration is based on the idea that teachers' professional learning and development, professional growth and well-being and their ability to learn, collaborate

and create a responsive, professional community should be seen as inseparable from their students' achievements and treated as an essential part of a developing school community (see, e.g. Fullan and Hargreaves 2016; Senge et al. 2012).

Because teachers have their own mental models and beliefs regarding schooling and learning, for them to learn together, they must be comfortable challenging their and others' beliefs and assumptions within a learning community. A teacher's job consists of participating in administrative and pedagogical decision-making processes, adapting to new regulations, pedagogical approaches and learning environments and adjusting to continuous learning demands (Paronen and Lappi 2018). Thus, this study combines several perspectives from the learning community literature (e.g. Senge 1990; Senge et al. 2012; Richard et al. 2016; FNBE (Finnish National Board of Education) 2014). The key for a school is to link the activities to the goals of a national core curriculum to enhance community members' learning, development and growth (Mitchell and Sackney 2011). A curriculum sets goals, as mentioned above, but also leaves room for interpretation regarding how a learning community should be developed in practice.

Learning communities can be understood as a school's collaborative culture, characterised by shared values, visions and learning orientations (Vangrieken 2018). For example, research on professional development has suggested that organisations should expand opportunities for continual learning and foster collaborative work cultures (Day 1999; Fullan 1995; Fullan and Hargreaves 2016; Senge 1990). The key is to understand how to increase individuals' learning capacity because "organisations learn only through individuals who learn" (Senge 1990, 139). Furthermore, learning is no longer just a matter for individuals; increasingly, it is a concern for all school organisations and communities (Senge et al. 2012). According to Finland's national core curriculum, "the school operates as a learning community and encourages all of its members to learn", and "a learning community creates preconditions for learning together and learning from each other" (FNBE (Finnish National Board of Education) 2014, 28).

At the heart of the core curriculum's learning community model is that a learning community touches on both children and adults (i.e. teachers, staff members and parents) and their learning (FNBE (Finnish National Board of Education) 2016), not only professionals such as teachers. The curriculum specifies the common principles on which the advancement and operation of a school are based. Thus, the core curriculum defines that a learning community "takes care of the safety and well-being of each member of the community", "systematically promotes versatile working approaches", "is aware of different languages and sees culture as a richness", "promotes participation and democracy", "promotes equity and equality" and "takes responsibility for the environment and focuses on a sustainable future" (FNBE (Finnish National Board of Education) 2016, 2). Also, the collaboration and interactions of the adults of a school and its surrounding society are emphasised (FNBE (Finnish National Board of Education) 2016). In our view, this may especially consider teachers who and schools that are amid various overlapping changes. For this reason, this study brings together teachers' mental models of collaboration and learning-community development to understand and develop a school community.

Data and methods

Research context and participants



In this case study, 41 primary and lower-secondary school teachers of a one-school community were interviewed to explore their mental models of teacher collaboration and professional learning and to deepen their understanding of their school's situation and aspirations for the future. The school was being turned into a unified comprehensive school, meaning that students from grades 1–9 (ages 7–16) will, as a one-school community, be studying in the same building as a single-track school. The collaborative development project lasted for two years (2018–2019), during which there was close collaboration between the teacher-educators and the entire school community – from students and teachers to principals. The teachers and principals voluntarily participated in this research project and signed consent forms before the interviews. All the teachers were informed of the aims of this study.

The themes of the semi-structured interviews were (1) professional development and learning, (2) collaboration, (3) school as a work community and (4) classroom-related work. We chose a semi-structured approach because interviewing teachers would enable us to obtain data based on their work-community experiences (Anne and Cross 2013) and uncover possible tacit and hidden knowledge. The semi-structured approach allowed the teachers to share their experiences without predetermining what kinds of collaborations we wanted them to report. The open-ended questions helped the teachers freely share their experiences (Anne and Cross 2013). The average interview time was 45 minutes. All interviews were conducted by teacher-educators and recorded and transcribed verbatim for analysis. The purpose of the individual interviews was to collect additional information about the initial state of the one-school community. More specifically, the teachers participating in this study were members of the future single-school community, thus representing diversity in the mental models of the one-school community.

Of the 41 teachers interviewed, 21 worked as primary school teachers (grades 1–6) and 20 worked as subject teachers (mainly grades 7–9), and their amount of teaching experience varied from one year to 34 years. This massive variability in teachers' experiences is explained by the nature of community based research and the school community. Regarding the diversity of experience and profession (i.e. primary school and subject teachers), from the perspective of comparing schools, all Finnish primary schools follow Finland's national core curriculum and that all teachers hold a master's degree. Finnish teacher education is a research-based academic education that focuses on combining the practices of teaching and research.

Understanding the teachers' representations and the aspects that may contribute to their mental models of teacher collaboration was identified through qualitative, data-driven but theory-informed content analysis (see Table 1) (Bernard and Gery 2009; DeCuir-Gunby et al. 2011). The analysis process was conducted in three phases. First, the coding relied on the three-part description of mental models by Rouse and Morris (1986), which led to an examination of three levels in the teachers' responses: how teachers (1) describe the school community's purpose and form, (2) explain the community's operation and system states and (3) predict the school's future system states. The first two of these levels concerned the current state of the school and were parallel, while the third concerned its future. Second, the qualitative data analysis started with an in-depth reading of the transcribed interviews

Table 1. Data collection and analysis

Phase 1	Phase 2	Phase 3	Phase 4
Data collection	Coding of the data	Creation of sub-categories	Interpretation of the findings in terms of the RQs
<p>Semi-structured interviews N=41</p> <p>Variables: 21 primary teachers 20 subject teachers Experience between 1-34 years of teaching</p> <p>Setting themes:</p> <ol style="list-style-type: none"> 1. Professional development and learning 2. Collaboration 3. School as a work community 4. Classroom-related work <p>Individual interviews that went on avg. 45 minutes</p>	 <ul style="list-style-type: none"> • In-depth reading and coding of the data with Atlas.ti Cloud • Mental models on teacher collaboration were identified through qualitative data-driven but theory-informed content analysis 	<ul style="list-style-type: none"> • Coding was cross-checked by the researcher team • Coded quotations were reviewed and subsumed to sub-categories and themes collaboratively 	<p>RQ1 "What forms of collaboration do teachers attach to their work?"</p> <p>RQ2 What do teachers think about different forms of collaboration, and what types of collaborative work do they consider relevant during a period of change?</p> <ul style="list-style-type: none"> • The analysis process and writing were carried out through collaborative discussions, which allowed an in-depth understanding of the data

and preliminary coding (Phase 2). Third, the quotations coded on matter-related representations of the teachers' mental models were the teachers' mental models were reviewed and subcategorised. They were then further categorised into three themes (Phase 3). During this phase, the subcategories were created, divided or combined. Finally, the analysed data were re-examined to identify patterns and determine research-question responses.

The coding (see Table 2) was conducted with *Atlas.ti Cloud*, a qualitative analysis programme that allows multiple users to work simultaneously and in real-time. In the analysis, we identified several levels in the teachers' interviews regarding the description, explanations and predictions of the future school community (Rouse and Morris 1986). The content analysis of this study involved dividing the transcribed interviews into subcategories and themes (Erlingsson and Brysiewicz 2017).

The analysis was conducted via collaborative discussions, which allowed us to obtain an in-depth understanding of the data. Alongside the analysis process, the coding was cross-checked by the researchers to ensure consistency. The coding logic and discrepancies were negotiated and carefully reviewed. The resultant codes were then discussed for agreement and clarification. The participant data were anonymised without distorting scholarly meanings, and when the data were collected, the research participants received privacy notices.

The research context and participants

Findings

Based on the mentioned analysis, three themes (see Figure 1) emerged: the nature of collaboration in the work community, teamwork and aspirations and expectations related to the shared school community

The nature of collaboration in the school community

In general, the teachers stated that it was challenging to share their time between individually oriented work and collaboration. Many of the teachers perceived that their workload prevented them from delving into complex issues about student learning, co-teaching and collaboration. For primary school teachers, a significant part of collaboration occurs by working with other teachers in parallel classes; similarly, collaboration among subject teachers consists of working with other teachers in teaching the same subject area. According to one subject teacher, the depth of collaboration varied from the occasional distribution of handouts and exam templates to cross-disciplinary collaboration, but it was mainly described as sharing and planning rather than co-teaching.

Interestingly, in the case of the subject teachers, the most significant features hindering deeper collaboration were those related to their working hours. According to the subject teachers, teaching hours (which vary according to the subjects being taught) and non-teaching duties (e.g. administrative meetings) set the conditions for collaboration. The main concern was that the teachers' shared time had been used mainly to monitor the construction of the future school building, which detracted from their ability to have a pedagogical discussion and plan. Thus, the teachers felt pressured to choose whether to focus on joint work or issues at hand, such as upcoming lessons. In the case of both primary teachers and subject teachers, it seems that there are tensions between demands to work collaboratively and actual practice:

Well, I can say that every year, someone (in the team) changes jobs or otherwise. Or the location of my classroom and the neighbour teacher changes; then, you can't get in and have time for simultaneous teaching. So, when someone tells you how to implement co-teaching, then they have done it for years. I think it requires that. But yes, we do it to the best of our ability. (Primary school teacher, 12/41)

No matter how much you feel the need to think and discuss together, when the day is over, you prefer to go home. Now, we have that common team time on Tuesdays, but with more time, we would get better results. But it's true that no one wishes to stay after school day because it's thought so that you go home first, prepare food, and then start checking papers or do whatever planning. But by allocating time for collaboration, we would be here until a certain number of hours, and then it would increase collaboration. (Subject teacher, 8/41)

The teachers noted that, partly due to how their days are scheduled, they do not have enough time to collaborate because holding lessons, various administrative meetings and lesson planning consumes most of their workday. The findings revealed that established organisational structures and traditions generally characterise teacher collaboration. According to the teachers, the scheduling of educational activities and the school's physical environment favour more traditional teacher-to-teacher collaboration (e.g. sharing ideas and materials). Some teachers suggested that much more discussion on shared schoolwide goals is necessary, and they questioned whether the school was genuinely cohesive.

While teachers regarded teacher-to-teacher collaboration as generally rewarding, they hoped it would include different activities, such as simultaneous teaching and multi-disciplinary learning. One subject teacher stated:

Table 2. Analysis leading to the subcategories and themes

Meaning unit	Condensed meaning unit	Code	Sub-category	Theme	Overarching theme
There, we, from the third to the ninth grade and all the teachers, are all in the same building. We must learn how to understand each other, know how to be flexible and think about more than just self-interest. We need to see the importance of all the roles in our school community. Suppose everyone understands the fact that it may not go as easy as we may think. Maybe, I hope, I have a little too many worries about the new school. (Primary school teacher, 38/41)	Developing shared understanding is important. The teacher fears how the school community will work. Teachers need to value each other's expertise	Predict future systems states	Work culture	Towards a shared school building	Teacher collaboration in the future school building

The thoughts of the new national core curriculum, those sound awfully nice, the multi-disciplinary ones. Still, how to attach those to our practice and schedule is really challenging; then, for us to agree on something like a new structure, it would indeed require thinking about structures, but it seems such a shocking workload. Then it must be something really great (laughter), so it would be worth the effort. (Subject teacher, 9/41)

At the time of data collection, the teachers worked in separate school buildings situated a significant distance apart. This contributed to the weakening of their sense of work community, as distance does not allow for genuine debate on important issues, such as how learning and teaching are seen (e.g. multidisciplinary learning and teachers' roles). Thus, some of the teachers stated that the temporary facilities made their work feel solitary, as seen in the excerpts of two primary school teachers:

Well, for example, I came here as a new teacher and sat on this new school's project-team. And further, I happen to be a person who is very open and optimistic about these new ideas. So, I'm upset that I don't yet know my colleagues, even by name, due to all the far-apart locations. I don't even have the chance to meet them, and it's a big problem because you don't get that normal practical discussion in the teachers' room. And then the discussion that arises is based on completely wrong things, and there are also misunderstandings. (Primary school teacher, 20/41)

Well, I don't collaborate that much. I collaborate mainly with the teacher in the next class because I teach English to his class, but it's limited. Somehow, right now, being in a temporary facility, the job is lonely. (Primary school teacher, 18/41)

Teamwork

The teachers who talked about the benefits related to teams mentioned that teams have helped teachers share their responsibilities more evenly; thus, they experienced collaboration as being efficient and useful. Some of the teachers expressed that the advantage of teamwork is that it is easier for a team to raise issues perceived as necessary to address. Similarly, the teachers noted that it was difficult for them to address a variety of issues on their own, and they noted that knowledge sharing and practical collaboration worked well in their teams.

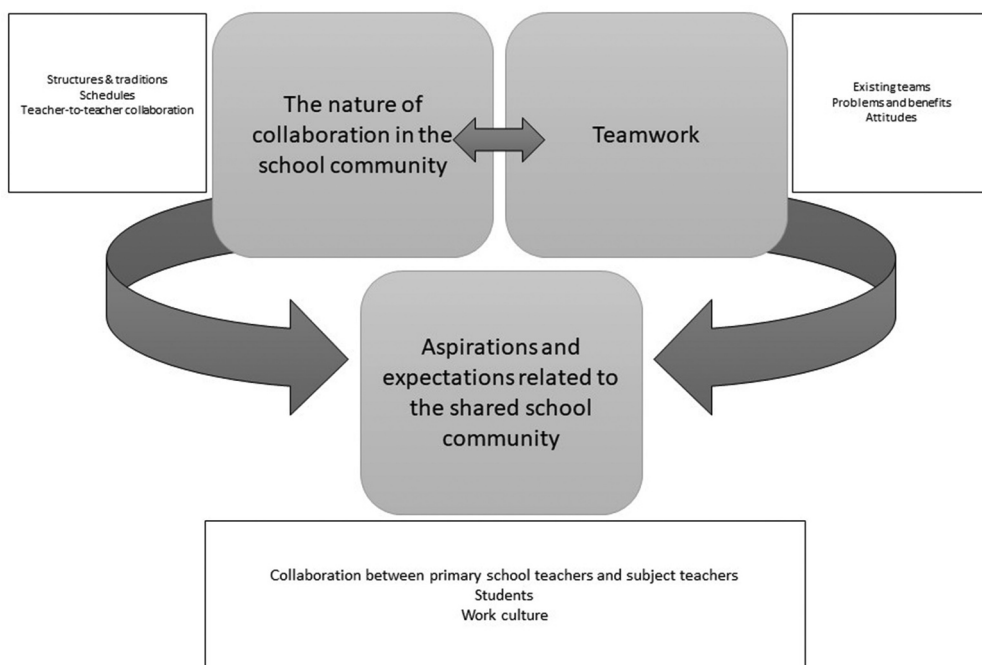


Figure 1. Representations of teacher collaboration.

However, as with teacher-to-teacher collaboration, there was a clear difference in performance between the assigned teams. The teachers stated that interpersonal chemistry in a work community dramatically influences teamwork. They noted that the chemistry was not good in some of the teams; this hampered the team to the point where nothing worked correctly. These teachers seemed to lose their commitment to the teams. One often-noted experience was that teamwork did not achieve results. Teams were given different tasks to perform, which negatively affected their work. The teachers experienced frustration because the teams tended to unexpectedly receive additional tasks. All of these reasons created a sense of inadequacy among the teachers.

The depth of collaborative planning and other forms of collaboration seemed to vary between the teams, and the culture of working alone was also echoed in the teachers' responses. Some teachers wanted to work alone, but others were forced to do so, as the subject teachers, who were the only teachers of their subject, felt that their work was lonely because the teachers did not share ideas with their colleagues. Several of the teachers were concerned about and had noticed that they tended to have different attitudes towards teamwork in terms of the work input and atmosphere they had experienced. The teachers knew there were problems in the teachers' attitudes, which was also reflected in the school's culture surrounding having discussions about important matters. A few of the teachers noted that even promising ideas do not always progress, which hampers teamwork.

In the following quote, a teacher explains how this is due to a more profound contradiction in the work community, which would require genuine reflection:

In the previous school, where I used to work, we had such a wonderful community; we were able to collaborate with everyone and talk about everything. There was also an open atmosphere. But it has changed, and the atmosphere is not as free as it used to be. You can't just go and say things to everyone anymore. Of course, this is overall because colleagues have changed, and now there have been all these significant changes (e.g., work in separate buildings). It feels like the whole atmosphere and everything has changed due to the new principal, temporary facilities and all, so there are small cracks among the staff. (Subject teacher, 21/41)

When talking about teamwork in their school, the teachers explained the existing team structure and their experiences. Teacher teams are formed around different themes and by grade level (primary school teachers were in teams according to grade level). The teachers noted that the teams had increased the amount of collaborative work. The teachers who are responsible for the entire class (primary school teachers) or a specific subject in a class (subject teachers) always belong to a grade-level team. The teachers who were not involved in the above-mentioned tasks chose which thematic team they wanted to participate in (e.g. events and celebrations or curriculum development).

The teams had weekly meetings. However, the study participants repeatedly noted that teamwork is perceived as subordinate to various schoolwide meetings, which makes it difficult for teams to schedule their meetings regularly because there can always be a reason to cancel a meeting. According to one teacher, this problem is partly due to the constraints imposed by collective agreements, which determine the time spent on collaboration, meetings and teaching (lessons). As planning a team meeting is perceived to be impossible, the content of team meetings is also reduced to sharing information and discussing topical issues.

In general, collaboration seemed to be more often the case for teams of primary school teachers than for subject teachers. Primary school teachers described that teamwork had improved because the schedules had been clarified and collaboration was part of everyday work. A teacher explained that this is because primary school teachers work on the same topics, and teaching tends to progress simultaneously between classes. In comparison, subject teachers often described that they either had no colleagues or had taught different grades due to the division of labour.

Interviewer: Is there something that prevents you from working together?

Well, time and schedules, of course; it is not always realistic for both teachers to have a double lesson without any prearranged theme so that something could be done, let alone take the time to design it. (Subject teacher, 31/41)

Well yeah, we do much collaboration. We have a team with the second-grade teachers, including a special education teacher and a special needs assistant. And yes, we do it all the time, like exchanging ideas. Every week, we meet as a team and plan together. We've had this now for several years, and it works just fine. And I think that our team members dare to say out loud if something is bothering or ask for help or advice. Well, there is an open atmosphere. (Primary school teacher, 27/41)

Aspirations and expectations related to the shared school community

When talking with the teachers about the future of the new school, where all grades, from three to nine, would be in the same shared school community, the teachers predicted that their jobs would include significantly more collaboration with other teachers.

One of the main findings is how the teachers talked about collaboration between primary and subject teachers; some teachers called for closer collaboration, whereas others saw no need for change. The cultural and educational differences between primary and subject teachers echoed in their talk. Some teachers discussed their feelings of suspicion about their roles and identities as teachers in the school community's new situation and structure. One of the teachers' main concerns was the assumption that they, instead of collaborating, would continue to work alone in the new facilities. According to one teacher, this would mean that collaboration could continue as it was before. However, several teachers assumed that teams must be allocated time to develop the work atmosphere. Most of the teachers who referred to the improved collaboration also wished that students of different ages could practice learning together; the teachers believed that the students' roles would grow with structural change. Still, most of the interviewees called for collaborative initiatives because there would be significant challenges in future schools if nothing were done.

As one teacher explained:

There, we, from the third to the ninth grade and all the teachers, are all in the same building. We must learn how to understand each other, know how to be flexible and think about more than just self-interest. We need to see the importance of all the roles in our school community. Suppose everyone understands the fact that it may not go as easy as we may think. Maybe, I hope, I have a little too many worries about the new school. (Primary school teacher, 38/41)

Discussion

This study explored Finnish basic education teachers' representation of mental models of collaboration in a school community to identify and understand the essential features that enhance and challenge teacher collaboration and what forms of collaboration teachers attach to their work. We also explored what teachers think about different forms of collaboration and what types of collaborative work they consider relevant during a period of change – in this case, the formation of a new school community. Referring to the framework based on (Senge's (1990), Senge et al. (2012)) work on learning organisations and Finland's national core curriculum (FNBE (Finnish National Board of Education) 2014) and its consideration for a learning community, our study examined the progress of a one-school community towards a unified comprehensive school.

In the Findings section, we presented varying aspects of teacher collaboration. Teacher collaboration has structurally supported or challenged elements of teachers' work. The teachers also identified challenges arising from personal chemistry, attitudes, ambitions and relationships; however, these same things also support collaboration.

In general, there are significant differences in how teachers and teams perceive collaboration and how they collaborate in the one-school community. First, the main finding was that while some of the teachers collaborated on a large scale, generally, the collaboration among teachers was limited to planning and sharing ideas. Second,

according to the teachers, engaging in administrative work (e.g. monitoring the new school building's construction process) and the lack of collegiality have impeded pedagogical discussions. Third, the teachers' experiences of collaboration were mostly limited to sharing teaching materials and ideas; they were less familiar with deeper forms of collaboration, such as co-teaching. Fourth, generally, the teachers had a positive attitude towards the unified comprehensive school, and they felt it offered new opportunities to develop cooperation and teaching. On the other hand, teachers felt that in a new school, change does not happen by itself, and old habits and practices may remain strong.

Because of these findings, it is sensible to consider how teachers' mental models and previous experiences have been constructed and how these mental models may affect future collaboration. First, the teachers represented the complex distinction between the classroom and subject teachers and the 'mental distance' between these two groups. This triggered a reflection on teachers' experiences of primary- and subject-teacher collaboration and how this collaboration is associated with assumptions and reinforcements within the school's culture. Thus, in the early stages of the project, the need to build collaboration between the teachers was emphasised. Second, the teachers also talked about the reasons for scarce collaboration, which is supported by previous studies, such as lack of time, having to do numerous tasks and cross-pressure between self-oriented work and learning-community development (Forte and Flores 2014; Opfer and Pedder 2011).

In particular, the teachers experienced their situation as challenging because the construction of the new school building and the work in temporary facilities limited their ability to engage in pedagogical discussions and dampened the school's atmosphere. Third, the findings revealed that the teachers have different mental models regarding the forms, quality and needs of collaboration. Several of the interviewees noted a lack of pedagogical dialogue in their school community. The importance of collaboration was widely emphasised by some of the teachers, but the school community also includes teachers who perceive collaboration as a less important part of their work, either due to time constraints, its minor influence on teaching design and quality or lack of colleagues, which was particularly relevant for subject teachers who taught their subject alone.

To conclude, the teachers' collaboration did not seem to include reflecting on teachers' practices or the collaborative design of teaching methods; in general, the teachers spoke little about improving student learning and more about ways to build school spirit and adopt common rules. Teachers' considerations, such as whether students are allowed to use cell phones while at school or whether students should go outside during their breaks, are related to the school's ongoing transition towards being a unified, comprehensive school. Thus, students' learning does not guide the development of the current community (Richard et al. 2016).

The teachers expressed that due to all the administrative work, they had limited opportunities for collegial reflections on students' learning; in other words, it was an essential part of the process to share their mental models about learning (Senge et al. 2012). Furthermore, the teachers reported that they primarily work alone; thus, there is no way for them to generate (or have) a shared vision. This also speaks of the prevailing school culture, as the spirit of the school community strongly portrayed teachers working in small groups, notwithstanding the rest of the school community. This is in line with the idea that teacher collaboration is strongly linked to an organisational context and is

influenced by cultural and micropolitical perspectives (Kelchtermans 2006). In this light, it is interesting to consider how the school community could benefit from observing the construction of a future school. Could it, at best, also act as a catalyst for a pedagogical debate, as a new learning environment enables various kinds of learning activities for students and asks teachers to collaborate?

To conclude, this study was driven by the need to understand multiple aspects of teacher collaboration. The findings illustrate that the current schedules and structures (i.e. time and space for collaboration and pedagogical development) do not allow teachers to achieve the goals of the core curriculum. Instead of changing structures, such as schedules, to make room for curriculum goals, some goals have been discarded because they are considered excessively time consuming to achieve (e.g. multidisciplinary learning modules). Some of the teachers did not consider teacher collaboration to be important (see, e.g. Hargreaves and O'Connor 2017; Johnson 2003), even though the national core curriculum emphasises the role of a learning community and dialogue (FNBE (Finnish National Board of Education) 2014). Although the national core curriculum emphasises that schools are developed through participation and that "all practices are geared to supporting the goals set for the educational work" (FNBE (Finnish National Board of Education) 2014, 27), the teachers called for a more clearly shared school vision and increased teacher collaboration, for example, co-teaching. These wishes also echoed the present cultural state of the school.

Although we know the complex nature of mental models, this analysis provides new insights into teachers' collaborations in a school community. The findings suggest that teachers experience diverse challenges related to implementing a collaborative culture. The critical question is how opportunities for teacher collaboration might be bolstered, thus making diverse mental models visible and negotiable (Senge 2006; Mevorach and Strauss 2012). However, according to the teachers, some forms of teamwork are more genuinely accepted as part of their work (e.g. teacher-to-teacher collaboration). In contrast, other forms (e.g. teamwork, pedagogical discussion and planning) either do not receive the same level of approval or teachers cannot see the value of collaborative work. In this case, mental models that remain hidden and silent guide a school's activities and thus potentially prevent change (Senge et al. 2012).

This study has some limitations. First, our data show the experiences of teachers from a one-school community. Second, the research data's collection and analysis were guided by close collaboration with the school, so we also accumulated information about the school community through other means (e.g. workshops, meetings, multidisciplinary learning module), and we made a special effort to describe only the issues the teachers raised in the interviews. Third, as 41 teachers participated in this study, the results contribute to the qualitative generalisations of teachers' representations of mental models, and not all perspectives can be brought to light in one article. Thus, we relied on analysis-based and systematic judgment to highlight individual examples. These issues were considered by exploring mental models, which, by nature, are ever-changing (Johnson-Laird 1983; Norman 1983; Werhane 2008). During the analysis, we kept in mind that the interviewees may have had various and diverse collaboration experiences. Consequently, we had to consider how teachers' mental models of collaboration depend on time and place and how they often remain tacit and undiscussed (Mevorach and Strauss 2012; Senge et al. 2012).

Regarding this study, for school-community, it was essential development to explore how in-service teachers make sense of the school community. Overall, reflecting on these issues is strongly related to this study's design. Furthermore, it was important to understand the information obtained from the research for the ongoing project with the school and Creative Expertise – Bridging Pre-service and In-service Teacher Education project. As learning community-related disciplines are strongly interrelated (Senge et al. 2012), exploring the teachers' mental models helped us build the later steps in a project aimed at the comprehensive development of the learning community.

Finally, schools are ever-changing systems that are constantly changing and driven by both environmental and internal changes. Our analysis suggests that when teachers must make a significant change in their teaching practices, adopt new skills and participate in a school's community development, school reforms must be studied holistically in the context of developing both the in-service and the pre-service phases of teacher education. We encourage similar research on in-service teachers' mental models and collaboration, as our approach and research methods offer an opportunity to understand the functioning and change of a school as a learning community. By examining yet scarcely explored in-service teachers' mental models, future research could address how to support teachers and school communities in advancing the principles and goals of the national core curriculum amid overlapping changes.

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